

JAN 1997

1. Which expression is equivalent to $\cot \theta + \tan \theta$?
- A. $\frac{1}{\sin \theta \cos \theta}$ B. $\frac{\cos \theta + \sin \theta}{\sin \theta \cos \theta}$ C. 1 D. 2
2. Which expression is equivalent to $\frac{1 - \cos 2\theta}{\sin 2\theta}$?
- A. $\tan \theta$ B. $\cot \theta$ C. $-\tan \theta$ D. $-\cot \theta$
3. How many solutions does the equation $(2 \sin \theta + 5)(3 \cos \theta + 3)(\tan^2 \theta - 2) = 0$ have over the interval $0 \leq \theta < 2\pi$?
- A. 4 B. 5 C. 6 D. 7
4. Solve: $3 \cos^2 x - 5 \cos x - 2 = 0, 0 \leq x < 2\pi$

JUNE 1997

5. Simplify: $\frac{2 \tan x}{\cos^2 x + \sin^2 x + \tan^2 x}$
- A. $2 \sin x$ B. $\sin 2x$ C. $\tan 2x$ D. $2 \cot x$
6. Solve: $2 \cos^2 x - 5 \cos x + 2 = 0, 0 \leq x < 2\pi$
- A. 0 B. $\frac{\pi}{3}, \frac{5\pi}{3}$ C. $\frac{2\pi}{3}, \frac{4\pi}{3}$ D. $\frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$
7. How many solutions does $\cos 3x = -1$ have over the interval $0 \leq x < 2\pi$?
- A. 1 B. 2 C. 3 D. 6

8. Which expression is equivalent to $4 \sin 6\theta \cos 6\theta$?

- A. $\sin 6\theta$ B. $\sin 12\theta$ C. $2 \sin 3\theta$ D. $2 \sin 12\theta$

JAN 1998

9. Simplify: $2 \cot x \sin^2 x$

- A. $\frac{\sin 2x}{2}$ B. $\sin 2x$ C. $\frac{2 \sin^3 x}{\cos x}$ D. $\cos 2x \sin x$

10. Solve: $2 \sec^2 x + 5 \sec x - 3 = 0$, $0 \leq x < 2\pi$

- A. 1.23, 5.05 B. 1.91, 4.37
C. 3.48, 5.94 D. $\frac{\pi}{3}$, 1.91, 4.37, $\frac{5\pi}{3}$

11. Solve: $\cos \frac{\pi}{2}x = 1$, over all real numbers

- A. $2n$, $n \in I$ B. $4n$, $n \in I$ C. $2 + 2n$, $n \in I$ D. $2 + 4n$, $n \in I$

12. Prove: $\frac{1 - \cos \theta}{\sin^2 \theta} = \frac{1}{1 + \cos \theta}$

JUN 1998

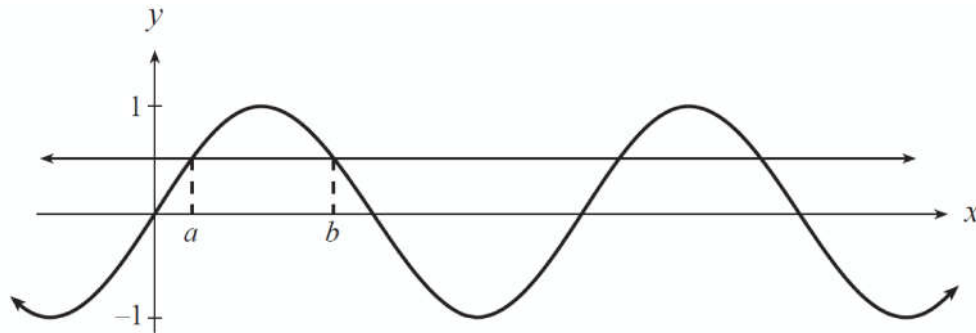
13. Determine all restrictions for: $\frac{\cot \theta}{1 - \sin \theta}$

- A. $\sin \theta \neq 1$ B. $\sin \theta \neq 0$
C. $\sin \theta \neq 1$, $\cos \theta \neq 0$ D. $\sin \theta \neq 0$, $\sin \theta \neq 1$

14. Given $\csc^2 \theta + \sin^2 \theta = 5.34$, find the value of: $\frac{1}{\csc^2 \theta} + \frac{1}{\sin^2 \theta}$

- A. 0.19 B. 2.27 C. 5.14 D. 5.34

15. Solve: $\sin \pi x > \frac{1}{2}$, over the real numbers, using the graphs of $y = \sin \pi x$ and $y = \frac{1}{2}$ shown below. Express the answers in terms of a and b .



- A. $a + n < x < b + n$ B. $a + 2n < x < b + 2n$
 C. $a + \pi < x < b + \pi$ D. $a + 2\pi < x < b + 2\pi$

16. Prove: $\frac{\csc \theta}{\tan \theta + \cot \theta} = \cos \theta$

JAN 1999

17. Which expression is equivalent to $\frac{\sin \theta + \cos \theta \cot \theta}{\cot \theta}$?

- A. $\csc \theta$ B. $\cos \theta$ C. $\sin \theta$ D. $\sec \theta$


18. Solve: $\sin 2\theta + 2 \cos \theta = 0$, $0 \leq \theta < 2\pi$

- A. $\frac{3\pi}{2}$ B. $\frac{\pi}{2}, \frac{3\pi}{2}$ C. $\frac{\pi}{2}, \pi$ D. $\frac{\pi}{2}, \pi, \frac{3\pi}{2}$

19. Let A be an angle in standard position such that $0 < A < \frac{\pi}{2}$. If $\sin A = n$ and $\cos A = m$, determine an expression for: $\sin(\pi + A) + \cos(\pi + A)$
- A. $-m - n$ B. $-m + n$ C. $m - n$ D. $m + n$

20. Prove: $\frac{\cot \theta}{\csc \theta - 1} = \frac{\csc \theta + 1}{\cot \theta}$

JUN 1999

21. How many solutions does $\tan^2 x + 5 \cos x - 8 = 0$ have over the interval $0 \leq x < 2\pi$? 
- A. 1 B. 2 C. 3 D. 4

22. Determine all restrictions for: $\frac{\sec x}{4 \sin^2 x - 1}$

A. $\sin x \neq \pm \frac{1}{4}$

B. $\sin x \neq \pm \frac{1}{2}$

C. $\cos x \neq 0, \sin x \neq \pm \frac{1}{4}$

D. $\cos x \neq 0, \sin x \neq \pm \frac{1}{2}$

23. Solve: $\tan^2 x = \tan x, 0 \leq x < 2\pi$

A. $0, \frac{\pi}{4}$

B. $\frac{\pi}{4}, \frac{5\pi}{4}$

C. $0, \frac{\pi}{4}, \pi, \frac{5\pi}{4}$

D. $0, \frac{3\pi}{4}, \pi, \frac{7\pi}{4}$

24. Prove: $\frac{\sin \theta + \tan \theta}{1 + \cos \theta} = \frac{\sin 2\theta}{2 \cos^2 \theta}$

JAN 2000

25. Determine all restriction(s) for: $\cot x$

A. $\sin x \neq 0$

B. $\cos x \neq 0$

C. $\cos x \neq 0, \sin x = 0$

D. no restriction(s)

26. Simplify: $\sin 5m \cos m + \cos 5m \sin m$

A. $\cos 4m$

B. $\cos 6m$

C. $\sin 4m$

D. $\sin 6m$

27. Solve: $2 \sin x \cos x + \sin x = 0, 0 \leq x < 2\pi$

A. $0, \pi$

B. $\frac{2\pi}{3}, \frac{4\pi}{3}$

C. $0, \frac{2\pi}{3}, \pi, \frac{4\pi}{3}$

D. $0, \frac{2\pi}{3}, \pi, \frac{5\pi}{3}$


28. Simplify: $\frac{\sin 2x}{1 - \cos 2x}$

A. $\cot x$

B. $\tan x$

C. $2 \cot x$

D. $2 \tan x$

29. Solve: $2 - x = \sin^2 x$ 

A. 1.06


B. 1.16

C. 2.43

D. 1.08, 1.68, 2.42

30. Prove: $\csc^2 x + \sec^2 x = \csc^2 x \sec^2 x$

JUN 2000

31. Solve: $\tan \theta - \cos^2 \theta = \frac{1}{2}, 0 \leq \theta < 2\pi$ 

A. 0.36, 3.50

B. 0.79, 3.93

C. 0.86, 2.74

D. 0.88, 2.94, 3.26, 3.74

32. Simplify: $\sin A \cos B + \cos A \sin B$ if $A = \left(\frac{\pi}{2} - B\right)$

- A. -1 B. 0 C. 1 D. $\frac{\pi}{2}$

33. Determine the number of solutions for: $(\csc \theta)(2 \sec \theta + 1) = 0$, $0 \leq \theta < 2\pi$


- A. 0 B. 2 C. 3 D. 4

34. Prove: $\frac{1}{\sec \theta + \tan \theta} = \frac{1 - \sin \theta}{\cos \theta}$

JAN 2001

35. Which expression is equivalent to $\frac{\cot \theta \sin \theta}{\sec \theta}$?

- A. $\sin^2 \theta$ B. $\cos^2 \theta$ C. $\sec^2 \theta$ D. $\csc^2 \theta$

36. Solve: $3 \tan\left(\frac{1}{2}x - 2\right) = 4 \sin 2x$, $0 \leq x < 2\pi$ 

- A. 1.48, 5.28, 5.94 B. 1.64, 3.56, 3.84 C. 2.20, 2.90, 4.60 D. 3.28, 4.90, 5.74

37. Which of the following is equivalent to $\cos(2\theta + \pi)$?

- A. $2 \sin \theta \cos \theta$ B. $-2 \sin \theta \cos \theta$ C. $1 - 2 \sin^2 \theta$ D. $2 \sin^2 \theta - 1$

38. Determine the amplitude of the function $y = k \sin \theta \cos \theta$, where k is a positive constant.

- A. $\frac{k}{2}$ B. k C. $2k$ D. $4k$

39. Prove: $\frac{\cot \theta - 1}{1 - \tan \theta} = \frac{\csc \theta}{\sec \theta}$

JUN 2001


40. Simplify: $\frac{2 \cos \theta}{\sin 2\theta}$

A. $\sin \theta$

B. $\cot \theta$

C. $\sec \theta$

D. $\csc \theta$

41. Solve: $\sec \theta + \cot \theta = 2, 0 \leq \theta < 2\pi$ 

A. 0.64

B. 0.93

C. 3.46, 5.13

D. 4.29, 5.97

42. Determine all restrictions for: $\frac{\csc \theta - 1}{\csc \theta + 1}$

A. $\sin \theta \neq 0$

B. $\sin \theta \neq -1$


C. $\sin \theta \neq 0, \sin \theta \neq -1$

D. $\sin \theta \neq 0, \sin \theta \neq \pm 1$

43. Prove: $\frac{\sin \theta \cos \theta}{1 + \cos \theta} = \frac{1 - \cos \theta}{\tan \theta}$

SPECS/SAMPLE 2001

44. Prove: $\frac{\sin 2x}{1 - \cos 2x} = \cot x$

45. Solve: $\tan x + \sin x = 1$, $0 \leq x < 2\pi$ 

A. 0.49, 4.22

B. 2.06, 5.80

C. 0.49, 1.57, 4.22, 4.71

D. 1.57, 2.06, 4.71, 5.80

46. Which expression is equivalent to $\frac{\cos 8x + 1}{2}$?

A. $\cos^2 4x$

B. $\sin^2 4x$

C. $\cos^2 16x$

D. $\sin^2 16x$

47. Determine the general solution for: $3 \sin 5x = 1$

A. $x = 0.07 + \frac{2n\pi}{5}$, $x = 0.56 + \frac{2n\pi}{5}$, $n \in I$

B. $x = 0.07 + \frac{2n\pi}{5}$, $x = 5.94 + \frac{2n\pi}{5}$, $n \in I$

C. $x = 0.07 + 2n\pi$, $x = 0.56 + 2n\pi$, $n \in I$

D. $x = 0.07 + 2n\pi$, $x = 0.56 + 2n\pi$, $n \in I$

48. Prove: $\frac{\cot \theta}{\sin \theta - \csc \theta} = -\sec \theta$

JAN 2002

49. Simplify: $\frac{\sin 2\theta}{\sin \theta}$

A. 2


B. $\sin \theta$

C. $\cos \theta$

D. $2 \cos \theta$

50. Which expression is equivalent to $\frac{\cos x + \cot x}{\sin x + 1}$?

- A. $\sec x$ B. $\csc x$ C. $\cot x$ D. $\tan x$

51. Solve: $\sin 3x + \tan x = 3$, $0 \leq x < 2\pi$ 


- A. 1.31, 4.34 B. 2.44, 3.85
C. 1.31, 1.57, 4.34, 4.71 D. 0, 2.44, 3.14, 3.85

52. Which expression is equivalent to $\sin\left(x + \frac{\pi}{3}\right) + \sin\left(x - \frac{\pi}{3}\right)$?

- A. $\frac{\sqrt{3}}{4} \sin x$ B. $\sin x$ C. $\sqrt{3} \sin x$ D. $2 \sin x$

53. Solve: $2 \cos^2 x + \cos x - 1 = 0$, over the set of real numbers

APR 2002

54. Solve: $\cos x = 2x$, $0 \leq x < 2\pi$ 

- A. 0.45 B. 0.58 C. 0.90 D. no solution

55. The expression $\cos 3x \cos 2x - \sin 3x \sin 2x$ is equal to

- A. $\sin x$ B. $\sin 5x$ C. $\cos x$ D. $\cos 5x$

56. Solve: $2 \cos^2 x - 1 = 0$, $0 \leq x < 2\pi$

- A. $\frac{\pi}{4}, \frac{7\pi}{4}$ B. $\frac{\pi}{3}, \frac{5\pi}{3}$ C. $\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$ D. $\frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$

57. Simplify: $\frac{\cos \theta}{\cot \theta} + \frac{1}{\csc \theta}$

- A. $\csc \theta$ B. $2 \sin \theta$ C. $2 \cot \theta$ D. $\sin \theta + \cos \theta$

58. Prove: $\frac{\sin 2x}{1 + \cos 2x} = \frac{\sec^2 x - 1}{\tan x}$

JUN 2002

59. Determine an expression equivalent to: $\sec \theta \cot \theta \sin \theta$

- A. 1 B. $\cot \theta$ C. $\csc \theta$ D. $\tan \theta$

60. Solve: $\sin 2x + \cos 3x = 1.5$, $0 \leq x < 2\pi$ 

- A. 3.84, 4.37 B. 4.97, 5.12
C. 5.07, 5.58 D. 1.20, 1.90, 3.76, 5.64

61. Simplify: $\sin(2x + \pi)$

- A. $\sin 2x$ B. $\cos 2x$ C. $-\sin 2x$ D. $-\cos 2x$

62. If the two smallest positive solutions of $\sin 3x = 0.4$ are $x = 0.14$ and $x = 0.91$, determine the general solution.

- A. $x = 0.14 + 2n\pi$, $x = 0.91 + 2n\pi$, $n \in I$ B. $x = 0.14 + 6n\pi$, $x = 0.91 + 6n\pi$, $n \in I$
C. $x = 0.14 + \frac{n\pi}{3}$, $x = 0.91 + \frac{n\pi}{3}$, $n \in I$ D. $x = 0.14 + \frac{2n\pi}{3}$, $x = 0.91 + \frac{2n\pi}{3}$, $n \in I$

63. Prove: $\sin 2x(\tan x + \cot x) = 2$


64. Simplify: $\frac{\csc^2 x - 1}{\csc^2 x}$

A. $\cos^2 x$

B. $\sin^2 x$

C. $-\cos^2 x$

D. $-\sin^2 x$

65. Solve: $3 \cos 2x = -x$, $0 \leq x < 2\pi$ 

A. 0.67

B. 0.52, 1.57

C. 0.67, 3.07

D. 0.95, 1.99

66. Determine the number of solutions for: $(a \sin x + a)(b \cos x - c) = 0$, where $0 \leq x < 2\pi$, and $1 < a < b < c$


A. 1

B. 2

C. 3

D. 4

JAN 2003

67. Solve: $\sin 2x - \cos x = 1$, $0 \leq x < 2\pi$ 

A. 0, 5.07

B. 3.14, 4.32

C. 3.14, 4.36

D. 0.42, 1.89, 2.95, 4.21

68. Simplify: $\cos(\pi - 2x)$

A. $-\cos 2x$

B. $-\sin 2x$

C. $\cos 2x$

D. $\sin 2x$

69. Determine a cosine equation that has the following general solution:

$$\frac{\pi}{2} + n\pi, \frac{\pi}{6} + 2n\pi, \frac{11\pi}{6} + 2n\pi, \text{ where } n \text{ is an integer}$$

A. $\cos x(2 \cos x + \sqrt{2}) = 0$

B. $\cos x(2 \cos x + \sqrt{3}) = 0$


C. $\cos x(2 \cos x - \sqrt{2}) = 0$

D. $\cos x(2 \cos x - \sqrt{3}) = 0$

70. Solve: $3 \cos^2 x + \cos x - 2 = 0, 0 \leq x < 2\pi$

71. Prove: $(\csc \theta - \sin \theta) \tan \theta = \frac{\sin 2\theta}{2 \sin \theta}$

JUN 2003

72. Solve: $\tan x - \cos x = -2, 0 \leq x < 2\pi$ 

A. 1.17, 4.10

B. 1.97, 5.32

C. 1.17, 1.57, 4.10, 4.71

D. 1.57, 1.97, 4.71, 5.32

73. Solve: $4 \cos^2 x = 3, 0 \leq x < 2\pi$

A. $\frac{\pi}{6}, \frac{11\pi}{6}$

B. $-\frac{\pi}{3}, \frac{5\pi}{3}$

C. $\frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$

D. $\frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$

74. Determine an expression equivalent to: $\tan \theta + \cot \theta$

- A. 1 B. $\sin \theta \cos \theta$ C. $\sec \theta \csc \theta$ D. $\sin \theta + \cos \theta$

75. Which expression is equivalent to $6 \sin 8x \cos 8x$


- A. $\sin 8x$ B. $\sin 16x$ C. $3 \sin 4x$ D. $3 \sin 16x$

76. Solve: $2 \sin^2 x - \sin x = 0$

a) where $0 \leq x \leq 2\pi$

b) over the set of real numbers

JAN 2004

77. Solve: $2 \sin x = \cos 3x$, $0 \leq x < 2\pi$ 

- A. 0.31, 3.45 B. 2.83, 5.98
C. 0.39, 2.75, 4.03, 5.30 D. 0.98, 2.16, 3.55, 5.89

78. Simplify: $4 \cos^2 6x - 2$

- A. $2 \cos 3x$ B. $4 \cos 3x$ C. $2 \cos 12x$ D. $4 \cos 12x$

79. If the smallest positive solution of $\tan bx = 2$ is $x = 0.3$, determine the general solution.


- A. $0.3 + 2n\pi$, $n \in I$ B. $0.3 + 2bn\pi$, $n \in I$ C. $0.3 + \frac{n\pi}{b}$, $n \in I$ D. $0.3 + \frac{2n\pi}{b}$, $n \in I$

80. Solve: $2 \tan x \sin x - \tan x = 0$, $0 \leq x < 2\pi$

JUN 2004

81. Determine an expression equivalent to: $\tan^2 \theta \csc \theta + \frac{1}{\sin \theta}$
- A. $\sec^3 \theta$ B. $\csc^3 \theta$ C. $\csc^2 \theta \sec \theta$ D. $\sec^2 \theta \csc \theta$
82. Solve: $2 \sin^2 x - 5 \sin x - 3 = 0$, over the set of real numbers
- A. $\frac{\pi}{6} + n\pi, \frac{5\pi}{6} + n\pi, n \in I$ B. $\frac{7\pi}{6} + n\pi, \frac{11\pi}{6} + n\pi, n \in I$
- C. $\frac{\pi}{2} + 2n\pi, \frac{5\pi}{6} + 2n\pi, n \in I$ D. $\frac{7\pi}{6} + 2n\pi, \frac{11\pi}{6} + 2n\pi, n \in I$
83. Prove: $\csc \theta \sin 2\theta - \sec \theta \cos 2\theta = \sec \theta$

AUG 2005

84. Solve: $\sin^2 x = 3 - x$ 
- A. 2.18 B. 2.97 C. 3.02 D. 3.09
85. Solve: $2 \cos^2 x + 3 \cos x + 1 = 0$
- a) where $0 \leq x \leq 2\pi$
- b) over the set of real numbers

86. Prove: $\cos 2x = \frac{\cot x - \sin 2x}{\cot x}$

AUG 2006

87. Determine an equivalent expression to: $\sin(2x - \pi)$

- A. $2 \sin x \cos x$ B. $-2 \sin x \cos x$ C. $\cos^2 x - \sin^2 x$ D. $\sin^2 x - \cos^2 x$

88. Determine the number of solutions for: $(a \sin x - b)(a \cos x - a)(b \sin x + a) = 0$,
where $0 \leq x < 2\pi$ and $0 < a < b$

- A. 3 B. 4 C. 5 D. 6

89. Solve: $3 \cos^2 x - 8 \cos x + 4 = 0$, over all real numbers

90. Prove: $\frac{\tan x(\cos x + \cot x)}{\sec x + \tan x} = \frac{\sin x \sin 2x}{2 - 2 \cos^2 x}$

SAMPLE 2008

91. Which expression is equivalent to $\sin(\pi + 2x)$?


- A. $2 \cos^2 x - 1$ B. $1 - 2 \cos^2 x$ C. $2 \sin x \cos x$ D. $-2 \sin x \cos x$

92. Solve: $\sqrt{3} \cos x \tan x + \cos x = 0$, $0 \leq x < 2\pi$

- A. $\frac{\pi}{6}, \frac{7\pi}{6}$ B. $\frac{5\pi}{6}, \frac{11\pi}{6}$ C. $\frac{\pi}{6}, \frac{7\pi}{6}, \frac{\pi}{2}, \frac{3\pi}{2}$ D. $\frac{5\pi}{6}, \frac{11\pi}{6}, \frac{\pi}{2}, \frac{3\pi}{2}$

93. Solve: $\cos 2x - 3 \sin x = 2$, $-\pi \leq x \leq \pi$

- A. $\frac{7\pi}{6}, \frac{11\pi}{6}, \frac{3\pi}{2}$ B. $\frac{4\pi}{3}, \frac{5\pi}{3}, \frac{3\pi}{2}$ C. $-\frac{\pi}{6}, -\frac{5\pi}{6}, -\frac{\pi}{2}$ D. $-\frac{\pi}{3}, -\frac{2\pi}{3}, -\frac{\pi}{2}$

94. Solve: $2 \cos x = 2^x$, $-\pi \leq x \leq \pi$ 

- A. $-1.45, 0.57$ B. $-1.38, 0.66$
C. $-1.38, 0, 0.66$ D. $-1.11, 1.72, 2.93$

95. Determine all restrictions for: $\frac{3 + 2 \csc \theta}{2 \sec \theta - 3}$

- A. $\sin \theta \neq 0$
B. $\cos \theta \neq \frac{2}{3}, \cos \theta \neq 0$
C. $\cos \theta \neq \frac{2}{3}, \sin \theta \neq 0, \cos \theta \neq 0$
D. $\sin \theta \neq -\frac{2}{3}, \cos \theta \neq \frac{2}{3}, \sin \theta \neq 0, \cos \theta \neq 0$

96. If the two smallest positive solutions for $\cos 4x = 0.6$ are $x = 0.232$ and $x = 1.339$, determine the general solution.

97. Prove: $\frac{\tan x}{\sec x + 1} = \frac{2 \cos x - 2 \cos^2 x}{\sin 2x}$


JAN 2008

98. Determine an equivalent expression for: $\sin 3x \cos x + \cos 3x \sin x$

- A. $4 \sin x$ B. $2 \sin x \cos x$ C. $4 \sin x \cos x$ D. $2 \sin 2x \cos 2x$

99. Solve: $4 \cos^2 x = 3$, $0 \leq x < 2\pi$

- A. $\frac{\pi}{6}, \frac{11\pi}{6}$ B. $\frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$ C. $\frac{\pi}{3}, \frac{5\pi}{3}$ D. $\frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$

100. Solve: $5 \sin^2 x = \cos x$ 

- A. 0.43, 1.78 B. 0.44, 5.84 C. 0.82, 1.73 D. 2.87, 3.58

101. Determine all restrictions for: $\frac{\sec x}{2 \sin x + 1}$

- A. $\sin x \neq -\frac{1}{2}$ B. $\sin x \neq 0$, $\sin x \neq -\frac{1}{2}$
 C. $\cos x \neq 0$, $\sin x \neq -\frac{1}{2}$ D. $\cos x \neq 0$, $\sin x \neq 0$, $\sin x \neq -\frac{1}{2}$

102. Solve: $2 \sin^2 x + \sqrt{3} \sin x = 0$, $0 \leq x < 2\pi$

103. If the smallest positive solution for $\tan 3x = 0.6$ is $x = 0.180$, determine the general solution.

104. Prove: $\frac{\sin \theta}{1 - \sin \theta} + \frac{\sin \theta}{1 + \sin \theta} = \sin 2\theta \sec^3 \theta$

ADDITIONAL QUESTIONS

105. Express $\sin x \cos x$ in terms of a single trigonometric function.

- A. $\frac{\sin 2x}{2}$ B. $\frac{\cos^2 x}{2}$ C. $2 \sin 2x$ D. $2 \cos^2 x$

106. What is the period of the graph of $y = 2 \cos^2 5x - 1$?

- A. $\frac{\pi}{5}$ B. $\frac{2\pi}{5}$ C. π D. 2π

107. Which expression is equivalent to $(\sin^2 \theta - \cos^2 \theta)^2 - \sin^2 2\theta$?

- A. $-2 \sin^2 2\theta$ B. $2 \sin^2 2\theta$ C. $-\cos 4\theta$ D. $\cos 4\theta$

108. Determine the amplitude of the function: $y = 6 \sin x \cos x$

- A. 2 B. 3 C. 6 D. 12

109. Simplify: $\cos^4 \theta - \sin^4 \theta$

- A. -1 B. $-2 \cos 2\theta$ C. $\cos 2\theta$ D. $\cos 4\theta$


110. Determine a single geometric mean between $\sec x - 1$ and $\sec x + 1$.

- A. -1 B. 1 C. $\cos x$ D. $\tan x$

2009 SAMPLE

111. Solve: $2 \cos^2 x - \cos x - 1 = 0$, $0 \leq x < 2\pi$

- A. $0, \frac{5\pi}{6}, \frac{7\pi}{6}$ B. $0, \frac{2\pi}{3}, \frac{4\pi}{3}$ C. $\frac{\pi}{6}, \pi, \frac{11\pi}{6}$ D. $\frac{\pi}{3}, \pi, \frac{5\pi}{3}$

112. Solve: $2 \sin x = 3 \cos x$, $0 \leq x < 2\pi$ 

- A. 0.31, 3.45 B. 2.83, 5.98
C. 0.39, 2.75, 4.03, 5.30 D. 0.98, 2.16, 3.55, 5.89

113. Determine the number of solutions in the interval $0 \leq x < 2\pi$ for: $\sin ax = \frac{1}{3}$
(a is an integer, $a \geq 1$)

- A. 2 B. $\frac{a}{2}$ C. a D. $2a$

114. Solve: $\sin 2x = \frac{1}{\sqrt{2}}$, $0 \leq x < 2\pi$

- A. $\frac{\pi}{8}, \frac{3\pi}{8}$ B. $\frac{\pi}{8}, \frac{3\pi}{8}, \frac{9\pi}{8}, \frac{11\pi}{8}$
C. $\frac{\pi}{4}, \frac{3\pi}{4}$ D. $\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$

115. Solve: $\sin x = \cos 2x$, $0 \leq x < 2\pi$

116. Solve: $2 \tan x \cos x - \sqrt{3} \tan x = 0$, $-\frac{\pi}{2} < x < \frac{\pi}{2}$

117. Solve: $\sin \frac{1}{3}x = \frac{\sqrt{3}}{2}$

a) where $0 \leq x < 2\pi$

b) over the set of real numbers

118. Determine the general solution: $\sin 2x = -\frac{1}{2}$

A. $\frac{7\pi}{12} + 2n\pi, \frac{11\pi}{12} + 2n\pi, n \in I$

B. $\frac{7\pi}{12} + n\pi, \frac{11\pi}{12} + n\pi, n \in I$

C. $\frac{13\pi}{12} + 2n\pi, \frac{21\pi}{12} + 2n\pi, n \in I$

D. $\frac{13\pi}{12} + n\pi, \frac{21\pi}{12} + n\pi, n \in I$

119. Solve: $\cos^2 x = \cos x$ over the set of real numbers

120. The two smallest positive solutions of $\sin 3x = 0.7$ are $x = 0.258$ and $x = 0.789$. Determine the general solution.

121. Solve: $6 \sin^2 x - \sin x - 2 = 0$ over the set of real numbers.

122. Solve: $\sin 2x - 2 \cos^2 x = 0$ over the set of real numbers.

123. Determine all restrictions for: $\frac{\tan \theta}{2 \cos \theta - 1}$

A. $\cos \theta \neq \frac{1}{2}$

B. $\sin \theta \neq 0$

C. $\sin \theta \neq 0, \cos \theta \neq \frac{1}{2}$

D. $\cos \theta \neq 0, \cos \theta \neq \frac{1}{2}$

124. Determine an expression equivalent to: $\frac{\tan \theta \csc^2 \theta}{\sec^2 \theta}$

A. $\tan \theta$

B. $\cot \theta$

C. $\tan^2 \theta$

D. $\tan^3 \theta$

125. Determine an equivalent expression for $\sin 3x \cos x + \cos 3x \sin x$

- A. $4 \sin x$ B. $2 \sin x \cos x$ C. $4 \sin x \cos x$ D. $2 \sin 2x \cos 2x$

126. Prove: $\frac{\cos x + \cot x}{\sec x + \tan x} = \cos x \cot x$

127. Prove: $\frac{2 \cos x + 2 \cos^2 x}{\sin 2x} = \frac{\sin x}{1 - \cos x}$

128. Determine an expression equivalent to $\cos(\pi + 2A)$

- A. $-\cos 2A$ B. $\cos 2A$ C. $-\sin 2A$ D. $\sin 2A$

129. Simplify: $\cos 2x \cos x + \sin 2x \sin x$

- A. $\cos x$ B. $\sin x$ C. $\cos 3x$ D. $\sin 3x$

130. Simplify: $\frac{2 \sin \theta}{\sin 2\theta}$

- A. 1 B. $\cos \theta$ C. $\csc \theta$ D. $\sec \theta$

131. Prove: $\frac{\tan x + \sin x}{1 + \cos x} = \frac{1}{\csc 2x} - \frac{\tan x}{\sec 2x}$

A FEW MORE QUESTIONS

132. Solve: $2 \cos^2 x = -3 \sin x$, $0 \leq x < 2\pi$

133. Prove: $\frac{1}{1 + \cos \theta} = \csc^2 \theta - \frac{\cot \theta}{\sin \theta}$

134. Given $\cos \alpha = \frac{3}{5}$, where α is in quadrant IV, and $\sin \beta = \frac{2}{3}$, where β is in quadrant II, determine the exact values for:

a) $\sin(\alpha - \beta)$

b) $\cos(2\beta)$

c) $\sin\left(\alpha + \frac{\pi}{3}\right)$

135. Given $\sin \gamma = \frac{5}{13}$, where γ is in quadrant I, and $\tan \delta = 2$, where δ is in quadrant III, determine the exact values for:

a) $\sin(\gamma + \delta)$

b) $\cos(\delta - \gamma)$

c) $\tan 2\gamma$